

**BEFORE THE COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY**

| | | |
|--|---|------------------|
| A-R CABLE SERVICES, INC. |) | |
| A-R CABLE PARTNERS, |) | |
| CABLEVISION OF FRAMINGHAM, INC. |) | |
| CHARTER COMMUNICATIONS |) | |
| GREATER WORCESTER CABLEVISION, INC. |) | |
| MEDIAONE OF MASSACHUSETTS, INC. |) | |
| MEDIAONE OF PIONEER VALLEY, INC, |) | |
| MEDIAONE OF SOUTHERN NEW ENGLAND, INC. |) | D.T.E. No. 98-52 |
| MEDIAONE OF WESTERN NEW ENGLAND, INC. |) | |
| MEDIAONE ENTERPRISES, INC. |) | |
| MEDIAONE OF NEW ENGLAND, INC. |) | |
| PEGASUS COMMUNICATIONS |) | |
| TIME WARNER CABLE |) | |
| |) | |
| Complainants, |) | |
| |) | |
| v. |) | |
| |) | |
| MASSACHUSETTS ELECTRIC COMPANY |) | |
| |) | |
| Respondent. |) | |

Direct Testimony of

Allen L. Clapp, P.E., R.L.S.

Witness for Respondent

TABLE OF CONTENTS

| | | |
|------|---|----|
| I. | Qualifications and Charge | 1 |
| II. | Overview | 5 |
| III. | The National Electrical Safety Code | 7 |
| A. | Background | 7 |
| B. | Joint-Use Poles | 9 |
| C. | Clearances | 12 |
| D. | Worker Safety | 16 |
| E. | Sag Characteristics | 19 |
| F. | Pole Height | 21 |
| G. | Terms and Conditions | 23 |
| H. | Summary | 24 |
| IV. | Comments on Glist Testimony | 26 |

I. Qualifications and Charge

Q. Please state your name, position, and business address, and summarize your qualifications as an expert witness regarding pole attachment matters.

A My name is Allen L. Clapp. I am President of Clapp Research Associates, P. C., and President of Clapp Research, Inc., both of 6112 Saint Giles Street, Raleigh, North Carolina 27612.

I have a Bachelor of Science degree in Engineering Operations and a Masters degree in Economics from North Carolina State University. I am a licensed Professional Engineer and a Registered Land Surveyor.

I have served as President of the North Carolina Association of Professions, President of the Professional Engineers of North Carolina, and a Director of the National Society of Professional Engineers. I am a former member of the Standards Board of the Institute of Electrical & Electronics Engineers. I am an active member of the following professional societies:

American Arbitration Association

American Society of Civil Engineers

American Society of Safety Engineers

Industrial Applications Society

Institute of Electrical and Electronics Engineers

1 National Fire Protection Association

2 National Safety Council

3 North Carolina Society of Surveyors

4 Power Engineering Society

5 Professional Engineers of North Carolina

6 Society of Cable Telecommunications Engineers

7 I have been involved with the design and operation of electric supply and communication
8 utility facilities since 1964. I have headed Clapp Research Associates, P. C., Clapp
9 Research, Inc. and their predecessor company (Clapp Research Associates) since 1985.
10 Clapp Research Associates, P. C. provides consulting engineering services to electric
11 power, telephone, and cable television utilities and to industries, including design and
12 construction advice, safety training, energy system analysis, technical analysis and
13 demonstrations, accident investigation and reconstruction, and arbitration. Clapp
14 Research, Inc. produces and sells safety training materials and courses and provides
15 consulting services other than engineering to industries and utilities.

16 The majority of my work with Clapp Research Associates, P.C. is (a) training utility
17 personnel in the intended application of the National Electrical Safety Code rules, OSHA
18 regulations, and other general industry practices for the design, construction, operation
19 and maintenance of electric supply and communication utility facilities, (b) working with

1 utilities to develop standard practices that are appropriate for their service conditions, and
2 (c) developing appropriate solutions to site-specific problems.

3 I served as Corporate Director of Technology Assessment with the North Carolina
4 Alternative Energy Corporation (now the Advanced Energy Corporation) for four years,
5 where I was also responsible for line management of the AEC's Industry and Utility
6 Programs. Previously, I served for eleven years with the North Carolina Utilities
7 Commission, initially as Chief of Operations Analysis, managing professional personnel in
8 the analysis of electric, gas and telephone utility operations, and later as Engineering and
9 Economics Adviser to the Commissioners and Hearing Examiner. Earlier, I was associated
10 with a consulting engineering firm designing electric distribution and transmission systems
11 and telephone systems.

12 I am a Member (Chair 1984-1993) of the National Electrical Safety Code (NESC)
13 Committee and editor of the NESC Handbook. The National Electrical Safety Code is
14 American National Standard C2; it contains the safety requirements for design,
15 construction, operation and maintenance of electric supply system lines and equipment and
16 communication system lines and equipment. The NESC Handbook is published by the
17 Institute of Electrical and Electronics Engineers (the NESC Secretariat) as a companion to
18 the code to explain the development and intended application of the NESC rules.

19 I represented the National Association of Regulatory Utilities Commissioners on the
20 NESC Committee until I became the Chair in 1984, at which time I became an Individual
21 Member of the Committee. I am a member of the following NESC Subcommittees:

1 Interpretations Committee 1976-present (Chair 1981-1990)

2 Coordination Subcommittee 1978-present (Secretary 1981-84, Chair 1993-present)

3 Clearances Subcommittee 1972-present (Acting Secretary 8 times)

4 Strengths and Loadings Subcommittee 1971-present (Secretary 1978-present)

5 During my preparation of the NESC Handbook and my NESC committee duties, I have
6 studied every document known to exist relating to the original codification and changes in
7 the rules of the National Electrical Safety Code, including memoranda from subcommittee
8 members, official interpretations, every rule in every code edition, published and
9 unpublished committee discussions, and preprints of the reasons for rule changes.

10 I regularly present short courses (from one to five days long) on NESC requirements for
11 the Institute of Electrical and Electronics Engineers, the American Public Power
12 Association, the National Rural Electric Cooperative Association, the US Army Corps of
13 Engineers, utilities, state utility associations, and government agencies. I have instructed
14 over 15,000 people in these seminars. Many of these seminars include OSHA
15 requirements. I am an authorized OSHA instructor.

16 I was responsible for revisions of sections of the 12th and 13th Editions of McGraw-Hill's
17 Standard Handbook for Electrical Engineers relating to the construction of overhead
18 utility facilities, and I am an author in the field.

1 I am a member of the ANSI Z535 Committee on *Safety Signs and Colors* (1994-date) and
2 chair the Z535.2 Subcommittee on *Environmental and Facility Safety Signs* (1995-date).

3 I have designed all types of overhead electric supply utility facilities, including high-
4 voltage transmission systems, distribution substations, local distribution lines, service
5 transformer facilities, and service installations. I have also designed utilization wiring
6 systems in buildings.

7 Q. On whose behalf is this testimony being presented?

8 A. The Respondent, Massachusetts Electric Company.

9 Q. What was your assignment in this proceeding?

10 I was asked to provide information concerning code requirements, practical problems and
11 concerns, and relative impacts of the addition of power, telephone, and CATV wires,
12 conductors, and cables to an overhead pole line. I was also asked to review and comment
13 on certain testimony and filings from Complainants. The materials I have reviewed are
14 listed in Exhibit ALC-1.

15 **II. Overview**

16 Q. What is your understanding of the basic nature of this case?

17 A. I understand that there is a disagreement among the parties as to the most equitable and
18 practical method of allocating the costs of joint-use poles to the appropriate utilities.

1 Q. Do you have experience with joint-use structures to support the facilities of both power
2 and communication utilities?

3 A. Yes. I have designed joint-use structures and the standards to which they should be
4 constructed since the mid 1960s. I am very familiar with both required clearances and
5 required structure strengths for such structures.

6 Q. What are the main issues involved in constructing and operating joint-use utility lines?

7 A. Joint use of overhead utility structures occurs when two or more utilities of the same or
8 different types [*electric supply* (power) or *communication* (telephone or CATV)] support
9 conductors or cables upon the same supporting structure. It is often less expensive for
10 multiple utilities to share supporting structures than to build separate lines. Using fewer
11 structures to support multiple facilities also impacts less on the use of the land by the
12 various suppliers.

13 The main issues to be addressed regarding joint-use poles are qualifications (and costs) of
14 workers, required clearances between facilities (and, thus, extra pole length), and required
15 strength of structures (and, thus, greater pole strength classes).

16 **III. The National Electrical Safety Code**

17 A. Background

18 Q. What safety standards apply to the construction, operation, and maintenance of joint-use
19 structures?

1 A. The National Electrical Safety Code (ANSI C2) is the American National Standard for
2 design, construction, operation and maintenance of both public and private power,
3 telephone, CATV, and railroad signal utility systems.

4 Around the beginning of this century, joint-use of utility structures for the same utility type
5 was accepted, but joint use of electric supply and communication facilities was
6 discouraged in the NESC. As the different industries learned how to safely coexist,
7 various provisions were added to the NESC to facilitate safe joint use of overhead and
8 underground structures. Consideration of joint-use facilities is now recommended by the
9 NESC.

10 Q. How are the requirements of the NESC developed?

11 The National Electrical Safety Code was originally started in 1913 by the National Bureau
12 of Standards at the request of the U. S. Congress. The NESC Committee is accredited by
13 the American National Standards Institute as having a balance of the interests involved.
14 NESC procedures are approved by ANSI. Originally, the NESC was revised every decade
15 or so. Since the Institute of Electrical and Electronics Engineers has taken over from the
16 National Bureau of Standards as the Secretariat of the NESC, the NESC has been revised
17 on a scheduled basis (originally 3 years; now 5 years). Revisions are a very public
18 process. The schedules are printed in each code book. Preprints of proposals and
19 subcommittee actions are made available for public comment. Consideration of comments
20 occurs before the balloting process (another public process) begins.

21 Q. How is the NESC used?

1 A. While there are many standards that cover specific practices or equipment used by the
2 electric supply and communication utility industries, the NESC is the safety standard used
3 by all, either directly or through utility standards developed therefrom. Exhibit ALC-2
4 shows a list of how every state uses the NESC in the regulation of utilities. Most states
5 adopt the Code in its entirety by commission rule or statute. All states without direct
6 adoption use the NESC in some fashion when the subjects covered by the Code arise. The
7 NESC is adopted by the Rural Utilities Services (formerly Rural Electrification
8 Administration) of the U. S. Department of Agriculture; RUS works with electric and
9 telephone cooperative utilities. The NESC is likewise adopted by the American Public
10 Power Association (the trade association of the municipal and public power utilities).
11 Both of these groups serve on the NESC Committee. The NESC has been adopted by the
12 various armed forces of the United States and is used to design and operate utility systems
13 in approximately 100 developing countries receiving help from U.S.A.I.D. programs.
14 Portions of the NESC are presently under consideration for adoption in Europe. The
15 NESC is considered the "Safety Bible" of the electric supply and communication utility
16 industries.

17 Q. What kind of standard is the NESC?

18 A. The National Electrical Safety Code is a performance standard. The NESC tells the utility
19 industries what must occur, and leaves wide latitude for the utilities to use measures
20 appropriate for the specific local conditions to meet its requirements.

1 Q. How does the NESC differ from the requirements of the Occupational Safety and Health
2 Administration?

3 A. Part 4 of the NESC contains the work rules applicable to power and communication work.
4 OSHA staff personnel participate on the NESC work rules subcommittee. Since the
5 NESC is changed much more often than OSHA, the NESC is usually more current.
6 Sometimes one will specify more detail in its requirements than specified by the other.
7 The NESC construction rules (Parts 1, 2, and 3 of the code) recognize the needs of the
8 worker in their clearances and strengths requirements.

9 B. Joint-Use Poles

10 Q. Please discuss the requirements placed on joint-use power and communication structures
11 by the NESC and the practical considerations that affect implementation of these
12 requirement.

13 A. The primary requirements are found in Exhibit ALC-3, attached to my testimony. Part 2
14 of the NESC is the *Safety Rules for the Installation and Maintenance of Overhead*
15 *Electric Supply and Communication Lines*. Rule 222—*Joint Use of Structures* reads as
16 follows.

17 **Joint use of structures should be considered for circuits along**
18 **highways, roads, streets, and alleys. The choice between joint use of**
19 **structures and separate lines shall be determined through cooperative**
20 **consideration of all the factors involved, including the character of**
21 **circuits, the total number and weight of conductors, tree conditions,**

1 **number and location of branches and service drops, structure**
2 **conflicts, availability of right-of-way, etc. Where such joint use is**
3 **mutually agreed upon, it shall be subject to the appropriate grade of**
4 **construction in Section 24.** (emphasis added)

5 Thus, joint use of facilities is allowed subject to appropriate construction, clearance and
6 operating standards.

7 When reading the NESC, two key words affect use of the requirements: *shall* and *should*.
8 If conditions are such that a *shall* rule applies, then the remedy specified by the Code must
9 be done. If a *should* rule applies, the Code recognizes that the specified remedy is
10 appropriate in the vast majority of cases, but that there are significant instances where
11 something else will be more appropriate, usually because of simultaneous conditions. By
12 its careful choice of words, the NESC recognizes that, while joint use is often desirable,
13 joint use is not appropriate in many locations. It also recognizes that, when joint use is
14 being considered, issues involving qualification of workers, required clearances, and
15 required strengths must be resolved.

16 Q. What are those standards?

17 A. Rule 220A promotes safety through standardization of the levels and locations of lines and
18 equipment by agreement of the utilities involved. This makes it easier to identify the nature
19 of the facilities and take the appropriate actions to work (or install provisions to allow
20 others to work) around the facilities safely.

1 Electric supply conductors should be located above communication cables and conductors
2 (Rule 220B). Communication workers are not allowed by either the OSHA regulations
3 (29 CFR 1910.268) or the NESC work rules (Rule 432) to position themselves above the
4 level of the lowest supply conductor on joint-use structures. Communication workers
5 must not come closer to supply facilities than the approach distances of Rule 431. Space
6 is needed at the structure to allow (1) communications workers to safely perform their
7 duties and (2) to help keep the feet of power workers from damaging communications
8 cables.

9 Q. How does the NESC address the safety space issue?

10 A. Electric supply and communication conductors and cables must be positioned so that they
11 will not become too close together in midspan under expected ice and thermal loading
12 conditions. To accomplish these goals, Rules 235 and 238 specify clearances between
13 power and communications facilities at their attachment to joint-use structures. These
14 rules give appropriate clearances between the closest facilities of each type by creating a
15 worker safety zone between the lowest electric supply facility and the highest
16 communication facility on the structure.

17 C. Clearances

18 Q. How are supply and communication facilities separated?

19 A. On joint-use structures involving power and communication facilities, the two kinds of
20 facilities are typically separated vertically. Rule 235C specifies the vertical clearances

1 (surface-to-surface dimensions, not center-to-center) between supply and communication
2 conductors and cables. The greater of two requirements must be met: (a) a basic
3 clearance at the structure and (b) a midspan clearance.

4 Rule 235C1 and Table 235-5 specify the basic clearances between the nearest conductors
5 and cables at the structure. Column 1, Row 1 of Table 235-5 requires a 40-inch vertical
6 clearance at the structure between the lowest supply conductor or cable (including
7 jumpers) and the highest communication conductor or cable below. Voltage adders apply
8 if the supply conductor exceed 8700 Volts-to-ground.

9 Q. How are the clearances measured?

10 A. These are surface-to-surface clearance requirements, not center-to-center spacing. The
11 lowest supply item is often a jumper connecting a tap to the main line. Similarly, the
12 highest communication item is often a jumper, particularly for some CATV installations.
13 Thus, the actual spacing of the bolt holes for the brackets supporting the lowest supply
14 item and the highest communication item usually exceeds the table clearance value by at
15 least 8 inches. In fact, the NESC used to specify a minimum spacing of 48 inches but,
16 since that is a design issue rather than a performance requirement, that specification was
17 removed from the code several editions ago. However, it is still often the minimum
18 spacing required to meet good practice for short span installations. Longer spans typically
19 require greater clearances because of the differences in sags. We use the following
20 illustration in our
21 NESC training seminars to illustrate this point.

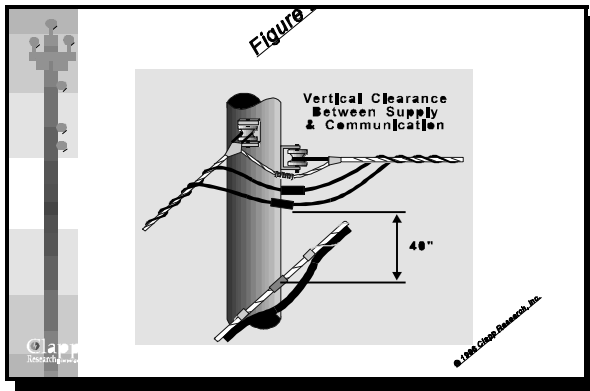


Figure 1

Q. Are there any exceptions to the 40-inch safety space?

A. Footnote 6 of Table 235-5 allows the basic 40-inch value to be reduced to 30 inches if the supply item above the communication is either an effectively grounded neutral meeting Rule 230E1 or a special electric supply cable construction (that includes a grounded sheath or shield around insulated energized conductors) meeting Rule 230C1. Although it is common to encounter a supply neutral below the high-voltage distribution-voltage conductors without accompanying energized secondary voltage cables or conductors, it is not common to encounter a cable meeting 230C1. The common duplex, triplex, or quadruplex secondary voltage or service voltage cables do not have a grounded sheath or shield and only meet Rule 230C3, thus requiring the full 40 inches.

The basic vertical clearance values of Table 235-5 apply between the lowest line or service conductor, cable, or jumper of the supply system to the highest conductor, cable, or jumper of the communication system. If the lowest supply item or highest communication item is a bracket, Rule 238 requires the same clearances as Rule 235 from the brackets, cables or conductors of the one type to the brackets, cables or conductors of the other

1 type. Rule 238 also recognizes the reduced clearance of 30 inches, if the supply item is a
2 grounded transformer tank or 230E1 neutral. The larger the brackets involved, the larger
3 will be the bolt-hole spacing required to maintain the required clearances at the pole.

4 Rule 238 recognizes that, for safety reasons relating to height above ground, traffic signal
5 brackets and street light brackets (both of which are worked by qualified supply workers)
6 may have to be located in the worker safety zone between the communication and power
7 systems. I serve on the Clearances Subcommittee of the National Electrical Safety Code
8 Committee and participated in the considerations of removing this provision from the
9 Code, in order to better maintain the worker safety zone between, and the visual
10 separation of, the electric supply conductors and cables from the communication cables
11 and conductors. However, the safety concerns for proper location of such lights for the
12 safety of the public led us to conclude that the present provisions should be maintained. If
13 such a bracket is required to be located in the worker safety zone, Rule 238 contains
14 clearance requirements between these items and communication items to allow safe work
15 by the qualified communication workers. The operational requirements of traffic signal
16 bracket and luminaire bracket location are flexible enough that they can be fitted between
17 other items on a pole without requiring extra pole height.

18 Rule 235C2b(1)(a) requires that differences in the sags of the upper and lower conductors
19 or cables (gravitational displacement below the line-of-sight between its points of
20 attachment to the structures at each end of the span) be recognized. Under Rule
21 235C2b(1)(a), the clearance at midspan (when the upper conductor or cable is at its

1 maximum sag) must never be less than 75% of the value required at the structure by Rule
2 235C1. Thus, 30 inches is required in midspan.

3 Q. What effect does the minimum midspan clearance have on the safety space at the point of
4 attachment?

5 A. If the maximum sag of the upper conductor or cable is more than the sag of the lower
6 conductor or cable (under the same ambient air conditions) by a sag difference greater
7 than 10 inches (or 25% of the structure attachment clearance value required by Rule
8 235C1), Rule 235C2b(1)(a) requires the clearance at the attachment points to be increased
9 until the midspan clearance is at least 30 inches (or 75% of the value required by Rule
10 235C1). Thus, for the longer spans, the vertical clearance between the highest
11 communication cable or conductor and the lowest supply cable or conductor may be
12 several times the basic clearance required by Rule 235C1 and Table 235-5.

13 Electric supply jumpers usually run no more than 10 inches below the supply attachment
14 level, while the midspan sag typically exceeds 10 inches of sag. Thus, supply jumpers do
15 not hang further down from the attachment bolt level than the midspan level of the cable
16 or conductors. Since the midspan clearance above ground usually controls attachment
17 height, jumpers for the electric supply conductor connections do not require additional
18 pole height. In contrast, any extensions of the communication equipment or jumpers above
19 their attachment bolt level usually requires additional pole length (except on the longest
20 spans) between the attachment bolt locations.

21 D. Worker Safety

1 Q. What are the implications of clearances for workers?

2 A. The foregoing discussion assumes that the work on the communication lines and
3 equipment will be performed by communication workers meeting the OSHA and NESC
4 work rule requirements for communication workers. If the work will always be performed
5 by qualified electric supply workers using OSHA and NESC work rules for supply
6 workers, lesser clearances are specifically allowed from communication facilities to
7 electric supply facilities.

8 Q. Why can clearances be reduced if qualified electric supply workers are used for the work
9 on communications facilities?

10 A. Significant differences exist between the training, supervision, procedures, and equipment
11 used by supply workers, not the least of which is that communication workers typically
12 use conductive metal buckets and booms, while supply workers use the more expensive,
13 insulated glass-fiber reinforced booms and buckets.

14 Q. Do these lower clearances apply to utility communication equipment?

15 A. Yes. Power companies have always had the need for communication between their
16 respective facilities and have typically installed a communication system along key
17 transmission routes to efficiently operate their systems. In Rules 224 and 235, the NESC
18 used to recognize these systems *as communication used exclusively in the operation of*
19 *supply*. With the advent of the fiber-optic communication cable systems capable of
20 carrying massive data and communication signals, the Code was overhauled to recognize

1 the true issues involved. Those were principally the safety of the workers who installed
2 and maintained these systems. There is no safety issue with respect to the type of
3 information carried, so Rules 224 and 235 were revised. These rules now recognize the
4 possibility of supply and communication utilities sharing the same communication line.

5 Rule 224A now recognizes the constraints necessary when any communication line is to
6 be installed in the supply space: *Communication circuits located in the supply space shall*
7 *be installed and maintained only by personnel authorized and qualified to work in the*
8 *supply space in accordance with the applicable rules of Sections 42 and 44* (emphasis
9 added). Section 42 applies to all electric supply and communication workers. Section 43
10 contains the few additional rules applicable to communication workers, including the
11 approach distances required from supply facilities. Section 44 contains the additional rules
12 that apply to electric supply workers.

13 Q. Why does the NESC distinguish between supply and communications workers?

14 A. For human safety reasons. The difference between the training of supply workers and
15 communication workers is typically years. Because of the safety issues involved with
16 working in the high-voltage spaces, electric supply workers can only be gradually
17 upgraded in allowed duties. The training, supervision, tools, equipment and protective
18 apparel and devices required for supply workers are time consuming and costly, compared
19 to that required for most communication workers.

20 Special constraints are also required by Rule 224A to limit the voltage that can be
21 transferred on the communication circuits and cables from the supply space to the

1 communication space, when it is necessary to bring such circuits down into the
2 communication space or over to a street, public place or building.

3 Since the power utilities already must meet these concerns to work on the power lines and
4 equipment, it is not unusual for electric supply utilities to install all of their communication
5 lines and equipment in the supply space. As a result of the additional safety concerns and
6 related expenses that must be considered when placing any communication line in the
7 supply space, it is rarely economical for communication utilities to place their facilities in
8 the supply space on a joint-use structure. Thus, the most common joint-use structures
9 designate a communication space below the supply space.

10 E. Sag Characteristics

11 Except for very short spans, the key determinants for the clearances required at the pole
12 between supply and communication attachments are the relative sag characteristics of each
13 cable or conductor. As a result, these factors and the required NESC basic clearance
14 determine the amount of extra pole length required to add communication to a power pole
15 (or power to a communication pole).

16 For the purposes of the sag-related clearances of Rule 235C2b(1)(a), the upper conductor
17 or cable must be considered to be at its lowest position (greatest sag). This will occur
18 under ice loading or thermal loading. The lower conductor or cable must be considered to
19 be unloaded and at the same ambient temperature that produces the determinant sag on
20 the upper cable or conductor.

1 Q. Please explain thermal loading and ice loading.

2 A. Line losses heat up conductors and are proportional to the square of the current involved.
3 If the worst-case sag of the upper conductor is in the summer, due to air conditioning load
4 on the hottest day, the sag of the lower conductor or cable that must be considered is that
5 which occurs at the same ambient air temperature, solar insolation, and wind cooling
6 conditions as those affecting the upper conductor. For example, if the electric supply
7 secondary conductors heat up to 212 °F on a 98 °F day (with heating from line losses and
8 the sun), the lower cable or conductor must be considered with its respective temperature
9 increase from the sun, but not from any electrical loading. Depending upon the insolation,
10 the lower one might be at 103 °F when the upper one is at 212 °F. At that time, the
11 clearance between them in midspan must be no less than 30 inches. If the lower conductor
12 or cable could be hotter, and thus sag below that level at another time, or if the ice-
13 covered lower conductor or cable would be lower than this position, then this sag
14 difference to the lowest sag position of the lower conductor must be added to the 30-inch
15 basic clearance in midspan to determine how much extra pole is required to accommodate
16 the added communication cable or conductor.

17 Ice loading affects small conductors more than large conductors. Ice tends to act as an
18 insulator, preventing the conductor from cooling as fast as it might in free air. Thus, for
19 many installations in icing areas of the country, the sag of the upper conductor or cable at
20 32 °F with the required ice loading (1/2 inch of radial ice through New England) will be
21 determinant. Since the greatest sag of an ice loaded conductor will be at 32 °F (additional
22 heating from line losses will begin to melt the ice off and lighten the conductor), 32 °F is

1 the assumed temperature of the upper conductor. Although ice tends to form on a
2 conductor only in a relatively narrow temperature range near 30 °F, ice can stay on the
3 conductor as the temperature drops to lower temperatures.

4 If the upper conductor is heated due to line losses from the electric heating load on the
5 cold nights, the appropriate ambient temperature for the lower conductor position will be
6 a colder temperature. In urban areas, it is not unusual for there to be enough electric load
7 on an ice-covered conductor for the conductor to warm up to 32 °F on a 0 °F day. Thus,
8 in such a case, the lower cable or conductor must have the required 30 inches of clearance
9 when the upper conductor or cable is heated up to 32 °F (and still retains its ice) and the
10 lower conductor is without ice at 0 °F. The total required additional pole length for such
11 an installation would, thus, be the 30-inch basic clearance plus the change in sag of the
12 lower conductor or cable to its greatest sag position due to ice or thermal loading.

13 Installing conductors and cables with desired sags and tensions is a mixture of craft and
14 science. It is difficult to know exactly the temperature of the items being pulled in. In
15 addition, as a conductor or messenger is pulled into place it begins to stretch and start the
16 transformation from its initial unstressed length to its final sag characteristics. Thus it is
17 difficult to know when it has been sagged and tensioned correctly. It is typical to allow a
18 “grace factor” based upon span length to take care of problems with tensioning
19 conductors and cable messengers and assure that clearance requirements will be met.

20 F. Pole Height

21 Q. What are the implications of clearances on pole height?

1 A. The pole height will have to be great enough to allow for the greater of (a) the basic
2 clearance between the items at the pole (including the jumpers and brackets), (b) the extra
3 length required to allow required clearances in the summer, or (c) the extra length
4 required to allow required clearances under ice loading.

5 Poles are specified as to length and strength class. Poles are required by NESC Sections
6 24, 25 and 26 to be able to withstand required assumed transverse, longitudinal, and
7 vertical loadings and required overload factors (safety factors) without overstressing the
8 materials involved. Transverse loads come from wind on the poles and supported facilities
9 and tend to overturn the pole or break it. Longitudinal loads are along the line; they come
10 from wire tensions, mismatches in wire tensions, changes in the angle of the line,
11 differences in span lengths, differentials in ice loadings from one span to the next, and
12 misapplied guying effects. Vertical loads come from the weight of all facilities (included
13 upper portions of the structure and ice loading) supported by the structure; they also
14 include the effects of eccentric loading, if poles are pulled over by misguying, etc. These
15 loads can also affect clearances as they change from season to season, and the NESC
16 requires such changes to be taken into account. Under NESC Rule 012B, it is the
17 responsibility of the utility or contractor entity doing the work to assure that the NESC
18 requirements are met.

19 The pole must be strong enough to withstand the effects of wind pressure on the pole and
20 on the supported conductors, cables and other apparatus. Just as moving a child out to
21 the end of a teeter totter affects the balance, so does the height of the apparatus affect the
22 overturning moment on the pole. The overturning moment is the product of the wind load

1 times the height above ground at which it is applied to the structure. This produces
2 bending in the pole. The fibers on the windward side are stretched and those on the
3 leeward side are compressed. The greater the binding moment, the greater the stress on
4 the pole fibers. The pole must be large enough that the fiber stress per square inch is
5 lower than the strength of the wood or the pole will break under wind loading.

6 The electric supply wires and equipment at the top of poles have longer lever arms (from
7 the ground line) than the communication facilities located below. However, many of the
8 communication cables are so much larger than the power conductors that the additional
9 wind load transferred to the poles by the communication cables more than offsets the
10 reduced lever arm. Large communication cables are often the greatest vertical loads
11 supported on a pole. It is not unusual for the greatest overturning moments on the poles to
12 be those created by the communication cables. In addition, it is not unusual for the
13 greatest longitudinal loads to be caused by communication cable messenger tensions.
14 Thus, a proportionately larger share of the cost of the pole related to pole class is
15 frequently caused by the addition of the communication cables.

16 G. Terms and Conditions

17 Q. What are your recommendations regarding basic terms and conditions for joint-use
18 attachments?

19 A. To assure appropriate safety, it is appropriate to require a make-ready inspection of every
20 span and structure for which joint-use attachments are proposed. It is usually not cost
21 effective to require a complete analysis of every proposed joint-use addition. Normally it is

1 better to make appropriate basic agreements that specify what can be added in what kinds
2 of situations (span lengths, pole sizes, etc.) and set up an appropriate review procedure for
3 the odd situations. Of necessity, such a system requires that additional clearance or
4 strength normally be provided to take care of the extremes of the distribution of types of
5 installations expected, but that is less expensive than doing a detailed analysis of sags and
6 tensions on each situation.

7 As a part of such practical systems, it is often appropriate for tables or charts to be
8 prepared that specify maximum sags of supply conductors and cables and minimum sags
9 of communication conductors and cables, all by type that can be readily identified by any
10 party. Within certain normal span length limitations, this is relatively easy to create and
11 use. For any specific installation, adding the 30-inch midspan clearance to the maximum
12 sag of the supply conductor or cable (plus a span-related safety factor) and subtracting the
13 minimum sag of the communication item will yield the required spacing between the
14 attachments. This is also an appropriate method for considering the additional length of
15 pole required for joint use.

16 Q. Do you have an opinion as to the NEES Companies' joint-use construction standards?

17 A. I have reviewed the New England Electric Service construction standards applicable to
18 joint-use construction; they appropriately contain and illustrate the clearances
19 requirements of the National Electrical Safety Code.

20 H. Summary

1 Q. You have just gone through a lot of detail concerning code requirements and its practical
2 implications for joint-use utility poles. Please summarize your testimony.

3 A. Electric utilities and communication utilities act on behalf of their respective customers.
4 Electric utility customers do not necessarily take service from any or all communication
5 utilities that might desire to jointly use facilities of the electric supply utilities. For
6 example, I do not subscribe to CATV even though it runs by my house on Carolina Power
7 & Light poles. Careful consideration of limitations on, and appropriate reimbursement
8 for, joint use of facilities constructed on behalf of electric utility customers is required to
9 limit cross-subsidization of CATV customers.

10 Because communications workers and equipment do not meet NESC requirements for
11 using the supply space on a pole, a "safety space" of 40 inches is created to separate
12 communications workers and equipment from high voltage power supply equipment.

13 To allow the completed joint-use installations to meet the 40-inch structure clearance
14 required between conductors, brackets, cables and jumpers located in the supply space and
15 the conductors, brackets, cables and jumpers located in the communication space, a
16 spacing of 48 inches between the lowest supply bracket bolt and the highest
17 communication bracket bolt is the practical minimum. In most installations, a greater
18 spacing between these mounting bolts will be required to allow room for the brackets and
19 jumpers.

20 If traffic signal span wire brackets or area light luminaire brackets are attached to a single-
21 use or joint-use pole, they do not require additional pole height and do not have a

1 significant impact on the allocation of usable space. Typically, they also do not require
2 significant additional strength. In contrast, the addition of communication cables and
3 equipment to a power pole, or the addition of power conductors and equipment to a
4 communication pole, will significantly impact both the height and the size of the pole
5 needed to support the facilities.

6 Typically, joint-use poles are at least 5 feet longer (to provide the vertical room) and one
7 to two strength classes larger in size (to take the increased overturning moment caused by
8 wind on the extra conductors or cables) than poles required for single use.

9 IV. Comments on Glist Testimony

10 Q. Have you had the opportunity to review the testimony of Mr. Paul Glist on behalf of the
11 Complainants?

12 A. Yes.

13 Q. Do you agree with his conclusion that the top 5 inches of the pole is usable space?

14 A. No. Mr. Glist's argument makes no practical sense to me.

15 Q. Why not?

16 A. The issue in this proceeding is where different attachments can be mounted on a pole, not
17 what can stick up above the pole, if anything. One cannot mount facilities to the top of
18 the pole; if the top bolt hole is placed higher than 5 inches below the top, the pole will split
19 out during service and drop whatever is attached. Over 100 years of attachment history

1 has made that point very clear. As a practical matter, very few things can be mounted
2 even that high, because twisting loads like unbalanced crossarms cause an even greater
3 frequency of poletop splits.

4 The issue is only that of where on the pole can one attach items. For communication
5 cables, the lowest attachment height above ground is dictated by the sag of the
6 communications cable and the midspan clearance. Jumpers hanging below splice boxes at
7 the pole do not sag enough to affect the required attachment height. The top attachment
8 point on any pole, be it communications-only, power-only, or a joint-use pole, cannot be
9 closer than 5 inches to the top or the pole will split. Nothing can be attached above that
10 level. Just as a jumper hanging below a splice box does not affect the portion of the pole
11 available for attachments, neither does anything that happens to stick above the top
12 attachment point affect the area available for attachments.

13 As previously discussed, the required clearances at the pole between power and
14 communications must be maintained between the lowest power apparatus and the highest
15 communications apparatus. Therefore, the space needed for a jumper extending above a
16 CATV splice box or the space needed for a jumper hanging below a power cable or
17 conductor will affect the area required for attachments. However, neither a
18 communications apparatus that hangs below the splice box at the pole nor a power
19 apparatus that extends above the top attachment point affects the area required for cable
20 or wire attachments.

1 Q. Mr. Glist also indicates that “the space used by cable on poles is pure surplus”. Do you
2 agree with that statement?

3 A. No.

4 Q. Why not?

5 A. The provision of communications space on a pole is not “pure surplus.” It is space
6 expressly designed into the distribution system to provide for multiple uses. In these days
7 of universal downsizings of utility work forces, no utility has sufficient staff to change out
8 poles unnecessarily. In addition, replacing poles on a case-by-case basis to accommodate
9 communications attachments increases pole inventory costs. Even if the attaching
10 communications party pays for the pole replacement, constant resizing and replacement is
11 not economically efficient. Most electric utilities plan ahead well enough that, if they are
12 installing a new pole line in an area that they expect new cable facilities will be installed
13 during its life, they will initially install enough pole to allow for the future attachment.
14 That is one reason that many of the poles today have the clearance already on the pole for
15 cable to attach. If the attachment does not materialize, the electric utility bears the extra
16 cost (which is not figured into the present cost allocation schemes). It makes no sense to
17 penalize a forward- thinking utility that installs a taller pole in the first instance to avoid
18 premature replacements. If Mr. Glist’s argument is adopted, then the only recourse
19 available to electric utilities (on behalf of their own customers) would be to stop looking
20 ahead and to impose additional pole change out costs on CATV companies. Such a policy
21 makes no sense to me. There are already enough poles in place that will require

1 replacement to make room for new communication attachments without unnecessarily
2 adding to the stock. In the future, this problem will be even more severe as competition in
3 the communications arena develops even more.

4 Many of the poles in service today were placed before CATV was expected. Because of
5 competition in the communications industry, many telephone companies that were going
6 underground are now adding cables overhead to compete with newly available alternative
7 communication providers on a first-cost basis. Many CATV providers have more than one
8 cable on the poles. The result for the foreseeable future is that space that might previously
9 have been available for one utility will be taken by another utility on a first-come, first-
10 served basis, unless other contractual arrangements are made.

11 Q. In the area of page 21 of his testimony, Mr. Glist discusses allocating the usable space by
12 using a simple average of an 11-ft usable space on a 35-ft pole and a 16-ft usable space on
13 a 40-ft pole. Please comment on the appropriateness of such an allocation methodology.

14 A. The height of a pole is a function of four requirements: (1) the vertical space needed by
15 the power facilities, (2) the vertical space needed by the communication facilities, (3) the
16 required worker safety zone between those facilities, and (4) the terrain. In essence, the
17 length of the top portion of a pole is set by the needs of the utilities and the worker safety
18 zone; typically it does not vary much for a given line. However, terrain forces the bottom
19 part of the pole to be extended for many poles, in order to get over terrain obstacles and
20 to gradually grade the rise and fall of the cables and conductors as they start up and start

1 down hills or fill in gullies. The result is that most of the need for 40-ft poles is caused by
2 terrain, not the need of the respective utilities.

3 In the United States, the predominant construction for rural power lines, with power and
4 telephone cables only, is with 30-ft poles. In flatter terrain, 25-ft poles are used in many
5 areas of the country for longer spans of power only or medium spans of power and
6 telephone. The basic poles used by Massachusetts Electric today are 35-ft poles, to allow
7 for multiple communication cables, power secondary cables, and rolling terrain. The
8 majority of the taller poles are required because of terrain requirements.

9 Mr. Glist's recommendations must, of necessity, assume that Mass. Electric's territory is
10 flat terrain and only 18 feet is needed from the ground to the first allowable attachment
11 point. This would be the exact equivalent of using only 30 foot poles and therefore the
12 equivalent usable space would only be 6.5 feet. If Mr. Glist's argument is to be used, then
13 the appropriate usable space for all attachments is only 6.5 feet. This is clearly not
14 consistent with the factual circumstances of the service territory involved. The additional
15 height of the taller poles is typically related only to terrain.

16 Q. Does this complete your testimony?

17 A. Yes, it does.

List of Information Reviewed

National Electrical Safety Code (ANSI C2-1997)

New England Electric System Distribution Construction Standards Book

The Complaint of A-R Cable Services, et al.

FERC Form 1, Annual Report of Major Electric Utilities, Licensees and Others (Massachusetts
Electric Company)

Use of the National Electrical Safety Code--*Revised April 1997*

| State | New Edition Automatically Adopted | Specifically Adopted This Edition | Have Used NESC to Develop Own Code | Has Own Code But Does Not Use NESC | Contact Person |
|----------------------|-----------------------------------|-----------------------------------|------------------------------------|------------------------------------|-------------------------|
| Alabama | Yes | | | | Will Straughn |
| Alaska | Yes | | | | Paul Morrison |
| Arizona | No (RM) | 1990 | | | Jim Brown |
| Arkansas | Yes | | | | Paul Mixson |
| California | | | | Yes | Byron D. Shovlain |
| Colorado | No (RM) | 1984 | | | Warren Wendling |
| Connecticut | Yes | | | | John T. Cox |
| Delaware | Yes | | | | Milak S. Michael |
| District of Columbia | Yes | | Yes | | Robert L. Hansen |
| Florida | No (RM) | 1993 | | | Jim Ruehl |
| Georgia † | ** | | | | Bob Evans |
| Hawaii | Yes | | | | Christopher Lai |
| Idaho | Yes | | | | Randy Lobb |
| Illinois | No (RM) | 1993 | | | Jerry Hope |
| Indiana † | No (RM) | 1993 | | | Jerry Webb |
| Iowa | No (RM) | 1993 | | | Donald J. Stursma |
| Kansas | No (RM) | 1993 | | | Mark F. Doltac |
| Kentucky | No (RM) | 1990 | | | Martha M. Morton |
| Louisiana | ** | | | | Roy F. Edwards |
| Maine | Yes | | | | Norman Leonard |
| Maryland | Yes | | | | Phillip E. VanderHeyden |
| Massachusetts | ** | | | | Boris Shapiro |
| Michigan † | No (RM) | 1990 | | | James R. Padgett |
| Minnesota † | Yes | | | | Al Krug |
| Mississippi | Yes | 1993 pts 2,3 & sec 9 | | | C. Keith Howell |
| Missouri | No | 1993 w/o pt 4 | | | Jim Ketter |
| Montana | No (RM) | 1993 | | | G. Joel Tierney |
| Nebraska | No (RM) | 1993 | | | Gene Hand |
| Nevada | No (RM) | 1981 | | | John E. Candelaria |
| New Hampshire | Yes | | | | Arthur C. Johnson |
| New Jersey | Yes | | | Yes | Nanik Aswani |
| New Mexico | Yes | | | | Albert Ibarra |
| New York | ** | | | | Michael Worden |
| North Carolina | No (RM) | 1993 | | | David F. Creasy |
| North Dakota | No (RM) | 1993 | | | Patrick Fahn |
| Ohio | No (RM) | 1993 | | | Ned Maxwell |
| Oklahoma | No (RM) | * 1990 | | | Bill Burnett |
| Oregon | No (RM) | 1993 | | | Robert Sipler |
| Pennsylvania | No (RM) | 1981 | | | Tolbert V. Prowell |
| Rhode Island | Yes | | | | Edward P. Kehoe |
| South Carolina | Yes | | | | Randy Watts |
| South Dakota | ** | | | | Martin C. Bettman |
| Tennessee | Yes | | | | Hal Novak |
| Texas | Yes | | | Yes | Sarut Panjavan |
| Utah | Yes | | | | Lowell Alt |
| Vermont | Yes | | | | Wayne L. Foster |
| Virginia | Yes | | | | Massoud Tahamtani |
| Washington † | | | Yes (1987) | | Ron Dillon |
| West Virginia | Yes | | | | Eral E. Melton |
| Wisconsin | No (RM) | 1993*** | | | Lanny L. Smith |
| Wyoming | Yes | 1993*** | | | Robert A. Larsen |

* 1993 currently in adoption process. † Did Not Respond to Latest Survey.

** No Commission Rule because all regulated utilities automatically use the latest code. Commission uses latest NESC as minimum when considering such things as transmission line siting.

*** Adopted with a number of changes, additions and deletions.

RM Commission Holds Rulemaking Proceeding to Adopt New Code.

1 **INTRODUCTION**

2 Q. Please state your full name and business address.

3 A. David M. Webster, 25 Research Drive, Westborough, Massachusetts 01582.

4

5 Q. Please state your position.

6 A. I am a Principal Financial Analyst in the Rate Department of New England Power Service Company (NEPSCO). NEPSCO
7 provides engineering, technical, accounting, and other services for the New England Electric System (NEES) Companies,
8 including Massachusetts Electric Company (Mass. Electric).

9

10 Q. Have you filed testimony previously in this case?

11 A. Yes, I submitted an affidavit in Mass. Electric's request for hearing in this proceeding.

12

13 **PURPOSE OF TESTIMONY**

14 Q. What is the purpose of your testimony?

15 A. My testimony describes the pole attachment calculation for the Company. The Company's pole attachment rate calculation is
16 attached as Exhibit DMW-1. In addition, I reconcile the Complainant's calculation to Mass. Electric's calculation and respond
17 to the points of difference between the two calculations.

POLE ATTACHMENT RATE CALCULATION

Q. Please summarize the pole attachment rate calculation.

A. The annual pole attachment rate for a solely owned pole is derived by multiplying the Company's net investment in bare poles by an annual carrying charge. The resulting product is in turn multiplied by a ratio of the space the pole attachment occupies to the average usable space of the Mass. Electric's poles. This calculation was completed in a manner consistent with the Department's approved calculation in Docket 97-82. Wherever Mass. Electric has deviated from the approved formula, Mass. Electric describes in detail the reason for the change. Mass. Electric's pole attachment rate is provided on page 1 of Exhibit DMW-1. I will further describe each element of the calculation in my testimony below.

Q. Has Mass. Electric made any changes to its previously filed calculation.

A. Yes. Mass. Electric has discovered that included in its total pole counts were wood poles associated with transmission and wood poles used for streetlighting purposes were included in its total pole count that served as a basis for its original calculation. Since the investment for these poles is not included in the FERC account for distribution poles (Account 364 - Poles, Towers and Fixtures), it would not be proper to include these poles in the pole population used to calculate the net investment per bare pole. Therefore, Mass. Electric has reduced its pole counts used to develop the cost per bare pole to exclude these wood transmission and streetlighting only poles.

It was also determined that the gross pole investment amount in the original calculation included Mass. Electric's investment in metal poles. Since the vast majority of Mass. Electric's distribution poles are wood and, as a result, Mass. Electric is only using wood distribution poles to develop its net investment per bare pole it is not appropriate to include the investment in metal poles in the gross pole investment component of the calculation. As a result, Mass. Electric has reduced its gross pole investment by the amount attributable to metal poles.

The effect of these adjustments has increased Mass. Electric's cost per bare pole from \$377 to \$382.

Q. What is Mass. Electric's recalculated attachment rate per solely owned pole?

A. Mass. Electric has determined that the pole attachment rate per solely owned pole is \$15.84 based upon the adjustments described above.

1 Q. How is Mass. Electric's rate per jointly owned pole determined?

2 A. The annual attachment rate for jointly owned poles is simply one-half (50%) the amount of the solely owned pole attachment
3 or, based upon the solely owned rate stated above, \$7.92 per jointly owned pole.

4

5 Q. Has Mass. Electric provided the source of the amounts used in its calculation?

6 A. Yes. The source of each component of the Company's calculation is included on page 5 of Exhibit DMW-1. These
7 components, where appropriate, have been taken from Mass. Electric's Annual Report on FERC Form 1 for the year ended
8 December 31, 1997.

9

10 **NET INVESTMENT PER BARE POLE CALCULATION**

11 Q. Please describe how the Mass. Electric's net investment per bare pole is calculated.

12 A. Please refer to Exhibit DMW-1. The first component of the calculation is Mass. Electric's gross investment in poles, towers
13 and fixtures (FERC Account 364) less any investment in metal poles. As described above, the vast majority of Mass. Electric's
14 distribution poles are wood and as a result Mass. Electric uses only wood distribution poles in the calculation to develop the
15 average cost per bare pole, therefore the metal pole investment should not be included in the attachment rate calculation. Mass.
16 Electric's gross investment, excluding the investment in metal poles, at December 31, 1997 was \$249,349,196. Please see
17 page 6 of Exhibit DMW-1 for the calculation of the investment in poles, towers and fixtures excluding metal poles.

18

19 Referring to Exhibit DMW-1, page 1, the gross investment is reduced by an apportioned amount of accumulated depreciation
20 (\$74,441,423) and net accumulated deferred taxes (\$26,856,857) relating for poles, towers and fixtures.

21

22 The resulting net investment of \$148,050,916 is then reduced by 15% to approximate a reduction in Mass. Electric's pole
23 investment for cross-arms and other appurtenances that are presumed not used or useful to attaching companies. This reduction
24 resulting in a further reduction to the net investment of \$22,207,637.

25

1 The remaining net investment in bare poles of \$125,843,279 is divided by the Mass. Electric's total equivalent number of
2 solely owned wood distribution poles. Mass. Electric's total equivalent number of wood distribution poles used in the
3 calculation was 329,383, resulting in a net investment per bare pole of \$382.

4

5 Q. How did you calculate the apportioned amount of accumulated depreciation?

6 A. The apportioned amount of accumulated depreciation was derived by calculating the percentage of Mass. Electric's pole plant
7 to Mass. Electric's total depreciable distribution plant. Total depreciable distribution plant is derived by removing the land and
8 land rights investment (because land and land rights are not depreciable items) from the total distribution plant investment.
9 This percentage is then multiplied against the amount of accumulated depreciation relating to distribution plant.

10

11 Mass. Electric has removed its investment in land and land rights because it believes it would be inappropriate to include items
12 that are not depreciable in a calculation to develop the factor upon which depreciation is allocated to depreciable items. If
13 Mass. Electric's investment in land and land rights were not excluded from the calculation, the amount of depreciation
14 apportioned to the depreciable property would be understated. Similarly, investments in land and land rights are excluded for
15 purposes of establishing depreciation expense in deriving Mass. Electric rates before the Department.

16

17 As pointed out in the Complainant's pre-filed testimony, the Department's formula does not include a provision to adjust the
18 depreciation allocator to exclude land and land rights from the calculation. While Mass. Electric did not participate in Docket
19 D.T.E. 97-82 and has not been able to determine from the Department's order whether the exclusion of land and land rights
20 was considered in developing the approved formula, Mass. Electric has excluded its land and land rights investment because it
21 believes that such an exclusion correctly calculates accumulated depreciation and the investment in land and land rights is
22 easily obtained from Mass. Electric's FERC Form 1.

23

24 Exhibit DMW-1, page 1, line B, shows the calculation of the apportioned amount of accumulated depreciation. The formula
25 approved by the Department in Docket 97-82 and adjusted to exclude Mass. Electric's investment in land and land rights as
26 described above, results in an apportioned amount of accumulated depreciation for pole plant is \$74,441,423.

27

28 Q. How did you calculate the apportioned amount of accumulated deferred taxes relating to the Mass. Electric's pole investment?

1 A. The apportioned accumulated deferred tax is calculated in a manner similar to the accumulated depreciation calculation
2 described above. The accumulated deferred taxes are apportioned to Mass. Electric's gross pole plant investment by applying
3 the percentage of the gross pole plant investment to the total electric plant investment against the accumulated deferred tax
4 reserve. The calculation of the apportionment of the accumulated deferred tax reserves is shown on Exhibit DMW-1, page 1,
5 lines LL and MM.

6
7 The deferred tax reserve is calculated by taking the net of the accumulated deferred taxes in FERC accounts 190, 281, 282 and
8 283 less any additional deferred tax reserves recorded by Mass. Electric to comply with Financial Accounting Standard No.
9 109 (FAS 109) issued by the Financial Accounting Standards Board (FASB) effective in December, 1992. In order to comply
10 with FAS 109, because of the past flow-through to ratepayers of accelerated tax benefits, Mass. Electric had to record
11 additional reserves for deferred income taxes as well as an offsetting regulatory asset to reflect the future recovery from
12 ratepayers of the past flow-through of accelerated tax benefits.

13
14 The calculation of the net pole investment should not reflect the additional FAS 109 related reserves for deferred income taxes
15 without reflecting the offsetting regulatory asset. Alternatively, the calculation of net pole investment can simply exclude the
16 FAS 109 related reserves for deferred income taxes. Any other treatment of such deferred taxes and related regulatory assets
17 would result in tax benefits which have previously been flowed through to ratepayers being inappropriately reflected as a
18 reduction in net investment. This would be both inequitable and inconsistent with Department precedent. See, e.g., *Mass.*
19 *Electric Co.*, D.P.U. 95-40-C (1995).

20
21 As discussed in the Complainants' testimony, page 18, lines 17 through 19, the Chief Accountant of the Federal Energy
22 Regulatory Commission (FERC) issued a letter dated April 23, 1993, to all of its jurisdictional utilities describing the required
23 methodology for accounting for deferred taxes associated with FAS 109. In that letter, which is attached as Exhibit DMW-2,
24 the Chief Accountant of the FERC states that the "Adoption of FAS 109 for FERC Accounting and reporting purposes should
25 not effect the measurement of costs included in an entity's billing determinations." (Page 11 of Exhibit DMW-2.) Therefore, to
26 eliminate any effects of FAS 109 on developing its cost of service, Mass. Electric has removed the accumulated deferred taxes
27 resulting from FAS 109, the amount of which is easily obtained from Mass. Electric's FERC Form 1, from its calculation. If
28 Mass. Electric had not adjusted its accumulated deferred taxes to exclude the effects of FAS 109, Mass. Electric would have
29 artificially overstated its accumulated deferred taxes for purposes of this calculation, contrary to FERC directives, thus
30 allowing the FAS 109 deferred taxes to have an effect on the billing calculation. As a result, the Complainant would receive a
31 benefit that Mass. Electric's ratepayers do not receive.

1

2

3

4

5

6

7

Q. Why does the Company use 15% as a reduction for cross-arm investment?

8

A. The 15% reduction for cross-arms and other appurtenance not used or useful for pole attachers is prescribed by the Federal

9

Communications Commission (FCC) rules governing the pole attachment rate calculation. The 15% standard was also

10

approved by the Commission in its order dated April 15, 1998 in D.T. E. 97-82. In that order the Department stated " The

11

Department finds that reducing the total net pole investment by 15 percent to account for items that are not used or useful to the

12

attaching companies, such as appurtenances, is reasonable". Therefore, Mass. Electric has adopted the Department's treatment

13

for appurtenances.

14

15

Q. Please explain how the Company calculated its equivalent number of poles used to develop the cost per bare pole.

16

A. The Company calculated its total number of equivalent poles based upon actual data obtained from its pole inventory database.

17

This database keeps individual records on each pole included within the Mass. Electric's distribution system which indicate

18

height of the pole, ownership of pole (e. g. solely-owned vs. jointly owned) and location of each pole by street within each

19

municipality served by the Company.

20

21

A copy of the summary report from this database, dated June 18, 1998, is included as page 7 of Exhibit DMW-1. This report

22

shows the total number of wood distribution poles within Mass. Electric's service territory segregated by pole height and

23

ownership type. Poles shown in the "other" category are poles not owned by Mass. Electric and therefore are eliminated from

24

the calculation since the amount of pole investment recorded on Mass. Electric's books does not reflect these poles. The total

25

number of equivalent poles is calculated by dividing the total number of jointly owned poles by 2 and adding the result to the

26

number of solely owned poles.

27

28

As shown on page 2 of Exhibit DMW-1, the total number of equivalent solely owned wood distribution poles shown in this

29

report amounted to 329,383.

1 Q. Why does Mass. Electric divide the number of jointly owned poles by 2?

2 A. The poles which are listed as jointly owned on the summary report from the pole location database represent those poles which
3 are co-owned by the Mass. Electric and Bell Atlantic. Since there are two owners of those poles, the total number of jointly
4 owned poles must be divided by 2 to convert these poles into a solely owned equivalent.

5

6 Q. Why have you used the Mass. Electric's entire wood distribution pole population to calculate the cost per bare pole?

7 A. In the calculation of the net investment to pole plant, Mass. Electric eliminated any investment in metal poles, therefore only the
8 wood distribution pole population should be used as the denominator. If anything other than the wood distribution pole
9 population were used in the denominator, the cost per bare pole would not be accurate.

10

11 **CARRYING CHARGE CALCULATION**

12 Q. What does Mass. Electric's carrying charge represent?

13 A. The carrying charge percentage contains several elements intended to allocate a proper amount of the operating and
14 maintenance and other charges required to keep the pole distribution system in good working order. These charges includes
15 annual depreciation of pole plant, cost of capital, administration and general charges as well as maintenance costs and taxes.

16

17 Q. What is the total carrying charge for the year ended December 31, 1997?

18 A. The total carrying charge for the year ended December 31, 1997 was 37.70%, which is shown on page 1 of Exhibit DMW-1,
19 line DD.

20

21 Q. How is the carrying charge calculated?

22 A. The carrying charge, as stated above, consists of several elements. Each element is calculated separately and the resulting
23 carrying charge percentages are added together to determine the overall carrying charge rate. The calculation of the individual
24 components is described below.

25

26 Q. Please describe the calculation of the administrative and general carrying charge.

1 A. The administrative and general (A & G) carrying charge reflects the percentage of total A & G expenses for the year 1997 to
2 the net electric plant investment as of December 31, 1997, as shown on page 1 of Exhibit DMW-1, lines I through N, results in
3 an annual A&G carrying charge of 7.80%. This calculation is done in accordance with the Department's approved
4 methodology in Docket 97-82.

5

6 Net electric plant in service is calculated by taking Mass. Electric's total plant in service at December 31, 1997 and subtracting
7 the total accumulated depreciation reserve and accumulated deferred taxes, net of FAS 109 tax reserves.

8

9 Q. Please describe the calculation of the tax component of the carrying charge.

10 A. The tax component of the carrying charge is calculated in a manner consistent with the methodology described above in
11 calculating the A&G carrying charge. However, normalized tax expenses is substituted for the A&G charges. Thus the tax
12 carrying charge is the result of normalized tax expense as a percentage of net plant in service. The tax carrying charge for the
13 year ended December 31, 1997 was 7.70%. This calculation, which is consistent with the methodology approved by the
14 Department in Docket 97-82, is shown on page 1 of Exhibit DMW-1, lines O through T.

15

16 Q. Please describe the calculation of the maintenance component of the carrying charge.

17 A. The maintenance component of the carrying charge is the percentage of the maintenance of overhead lines expense (FERC
18 account 593) to the net investment in overhead line plant. The calculation, as shown on page 1 of Exhibit DMW-1, lines U
19 through W, is consistent with the methodology approved by the Department and results in a maintenance carrying charge of
20 6.10% for the year ended 1997.

21

22 The net investment in overhead line plant is calculated by taking the sum of the plant balances at December 31, 1997 for Poles,
23 Towers and Fixtures (FERC account 634); Overhead Conductors and Devices (FERC account 365); and Services (FERC
24 account 369). The sum of the overhead line plant is then reduced by an apportioned amount of accumulated depreciation and
25 deferred taxes. The apportionment of the deferred taxes and depreciation is done in a manner consistent with the apportion of
26 these elements for the pole plant investment describe above. However, instead of apportioning the depreciation and deferred
27 taxes to just the pole plant, this calculation apportions depreciation and deferred taxes for overhead line plant. The
28 apportionment calculation takes the percentage of the investment in overhead line plant to total distribution plant (excluding

land and land rights) for depreciation and the percentage of total overhead line plant to total electric plant for accumulated deferred taxes.

Q. How was the depreciation portion of the carrying charge calculated?

A. Please refer to page 1 of Exhibit DMW-1, lines X through BB. The depreciation component of the carrying was calculated by “grossing-up” the annual depreciation rate to reflect the depreciation rate on an accumulated basis. This “gross-up” amount is calculated dividing the amount of gross pole plant by the net investment of the pole plant, resulting in a “gross-up” of the annual depreciation percentage of approximately 168%.

The annual depreciation rate of 4% is based on a pole plant life of 25 years. Thus when applying the “gross-up” ratio is applied to the annual depreciation rate of 4%, the resulting carry charge for depreciation is equal to is 6.74%. The calculation of the depreciation carrying charge is in accordance with the formula approved by the Department in Docket 97-82.

On March 1, 1998, Mass. Electric implemented new depreciation rates in accordance with the Department’s order in Docket 96-025. While these new depreciation rates have no effect on the current pole attachment rate calculation, the depreciation carrying charge will increase to reflect these changes starting with the pole attachment rate calculation based upon 1998 financial information.

Q. How is the cost of capital component of the carrying charge determined?

A. The cost of capital component represents the weighted cost of capital for Mass. Electric as of December 31, 1997 (Exhibit DMW-1, page 1, line CC and Exhibit DMW-1, page 5). The weighted cost of capital of 9.35% for Mass. Electric reflects a return on common equity of 11.00%. The common equity amount was used in the distribution cost of service and equity return “collar” mechanism which was approved by the Department in Docket 96-025. The actual costs rates for debt and preferred stock reflects actual costs as of December 31, 1997.

USABLE SPACE CALCULATION

Q. Please describe how usable space is calculated.

1 A. Usable space is calculated by first determining the actual average pole height of the wood distribution pole population with
2 cable attachments. Once the average pole height is calculated, certain items must be deducted from the average pole height to
3 calculate the average usable space per pole. The items which must be deducted are minimum attachment height, average
4 burial depth, safety (separation) space as required by the National Electric Safety Code (NESC), and unusable space at the very
5 top of poles.

6
7 Q. How is the actual average pole height determined?

8 A. As previously mentioned, Mass. Electric maintains a pole inventory data base. This database keeps individual records on each
9 pole included within Mass. Electric's distribution system which indicate height of the pole, ownership of pole (e.g. solely-owned
10 vs. jointly owned) and location of each pole by street within each municipality served by Mass. Electric.

11
12 As shown on page 3 of Exhibit DMW-1, Mass. Electric takes actual wood distribution pole counts for only those poles with
13 cable attachments and categorizes them by height and ownership type. Mass. Electric then multiplies the total height figure for
14 each category (e.g. in the 35 foot category) by the total number poles (including "other" poles) within that category to
15 calculate the total pole height for each individual size pole. For example, the 35 foot pole height category consists of 189,961
16 jointly owned poles, 11,045 solely owned poles and 49 other poles for a total of 201,055 35 foot poles. To calculate the total
17 pole height for the 35 foot category, the 201,055 poles are multiplied by 35 feet, resulting in a total pole height for that
18 category of 7,036,925. A calculation like this is performed for each height category and the results are added together to
19 determine the total pole height for Mass. Electric. The pole height for Mass. Electric for those wood distribution poles with
20 cable attachments amounted to 12,269,320 pole feet. The total pole feet is then divided by the total number of poles to produce
21 an average pole height. The average pole height for Mass. Electric is 36.49 feet.

22
23 Q. What is the next step in calculating average usable space once the actual average pole height is determined?

24 A. As described above, once the actual average pole height is determined, several items must be removed from the actual average
25 pole height to arrive at the average usable space per pole. The calculation of the average usable space per pole is shown on page
26 4 of Exhibit DMW-1. The first item to be removed is the average burial depth per pole. Mass. Electric's construction standards
27 state that the minimum amount of burial per pole shall be set at 10% of the actual pole height plus two feet. (The Mass.
28 Electric construction standards are described in detail in the direct testimony of Mr. Anundson.) Thus the average burial depth
29 for those poles with cable attachments for Mass Electric is 10% of the average pole height plus two feet. This calculation results
30 in an average burial depth for Mass. Electric of 5.649 feet.

1

2 Q. How is the minimum attachment height determined?

3 A. The minimum attachment height of 18 feet is an FCC rebuttable presumption. Mass Electric has adopted this presumption in its
4 calculation.

5

6 Q. What is the separation (safety) space reduction in Mass. Electric's calculation?

7 A. Mass. Electric has removed 40 inches (3.33 feet) of space from the actual average pole height to reflect the separation or safety
8 space as mandated by the NESC and as required by OSHA work rules. Please see the direct testimony of Messrs. Clapp and
9 Anundson for further explanation of the safety space.

10

11 Q. Why has Mass. Electric removed pole top space from its calculation?

12 A. Mass. Electric has removed 5 inches (.42 feet) of pole top space from its usable space calculation. Mass. Electric construction
13 standards, as described in detail in the direct testimony of Mr. Anundson, deems 5 inches unusable.

14

15 Q. What is Mass. Electric's average usable space per pole?

16 A. Mass. Electric's average usable space per pole is 9.091 feet per pole. This is calculated by deducting the average burial depth of
17 5.649 feet, the minimum attachment height of 18 feet, the NESC separation space of 3.33 feet and the unusable portion of the
18 pole top (.42 feet) from the actual average pole height of 36.47 feet.

19

20 Q. How is the use ratio per pole determined?

21 A. The use ratio is determined by taking the presumption that each attachment to the pole occupies 1 foot of space and dividing it
22 by the average pole height to develop the average use ratio per pole. Therefore, Mass. Electric's calculation would result in a
23 use ratio of 11.00% (1 foot divided by the average usable space per pole of 9.091 feet).

24

25 **COMPARISON OF CALCULATIONS**

26 Q. Have you prepared a comparison of Mass. Electric's calculation to the calculation submitted by the Complainants?

1 A. Yes. I have attached this comparison as Exhibit DMW-3.

3 Q. Would you please explain the difference between the two calculations regarding net investment per bare pole?

4 A. As shown in Exhibit DMW -3, Mass. Electric's calculation results in an net investment in bare poles of \$382 per pole. The
5 calculation submitted by the Complainants results in an net investment per bare pole of \$324, or a reduction of \$58 per pole
6 from the calculation provided by Mass. Electric. The difference in the net investment per bare pole is principally the result of
7 the manner in which the two calculations treat depreciation, FAS 109 deferred taxes and the investment in appurtenances. Also
8 affecting the net investment per bare pole is the adjustment Mass. Electric has made to remove its investment in metal poles as
9 discussed above.

11 As shown in Exhibit DMW-3, line A, the metal pole investment adjustment results in a reduction of \$558,767 to the gross pole
12 investment balance, therefore reducing Mass. Electric's net investment per bare pole cost.

14 The adjustment Mass. Electric has made to remove land and land rights from the depreciation allocator has resulted in
15 additional depreciation apportioned to pole plant. This adjustment resulted an additional \$548,372 of depreciation being
16 allocated to poles. As discussed above, this adjustment does not follow the Department's approved formula in Docket 97-82,
17 however Mass. Electric believes it is proper to make this adjustment based upon past Department practices regarding
18 depreciation.

20 Mass. Electric has also adjusted its accumulated provision for deferred taxes to exclude the impacts of FAS 109. The formula
21 approved by the Department in Docket 97-82 does not make any adjustment to the accumulated deferred tax balances to
22 exclude any FAS 109 impacts. However, Mass. Electric has made this adjustment based upon past regulatory practices
23 approved by the Department and accounting guidelines issued by the Chief Accountant of the FERC. The Complaints
24 characterize Mass Electric's adjustment as an "error" and object to it because, as shown on Line C on Exhibit DMW-3, it
25 increases Mass. Electric's net investment in pole plant by \$1,298,806.

27 As stated above, Mass. Electric has made certain adjustments to the Department's approved formula to account for items which
28 it believes should be removed from the formula. While the Complainants consider the adjustments made by Mass. Electric as
29 "errors", the Complainants have also taken liberties with the approved calculation to the extent those liberties benefit them. For

1 example, the adjustments the Complainants have made to the pole appurtenances do not follow the Department's approved
2 calculation and are not set by any Department precedent. However, the Complainants have determined, from plant data which
3 is not publicly available but was provided by Mass. Electric, that they should have an actual appurtenance reduction of
4 approximately 26% or an additional \$17,048,964 reduction in appurtenances above the prescribed methodology approved by
5 the Department as shown on Line E of Exhibit DMW-3.

6
7 The number of equivalent poles used in each calculation is different since Mass. Electric has used updated pole counts which,
8 as previously stated, exclude transmission and streetlighting-only poles.

9
10 Q. Please describe the differences in the carrying charge calculations between the two formulas.

11 A. The difference in carrying charges between the two calculations, while small, is the result of the way each party treats the items
12 affecting the net investment calculation described above. Because the methodology in developing the carrying charges is based
13 upon the net investment in plant in service, any differing methodologies in the treatment of depreciation, FAS 109 deferred
14 taxes and appurtenances, where appropriate, will effect the determination of net plant investment. Therefore, the way in which
15 these items are treated will have a direct impact on the carrying charge rate.

16
17 Q. Please describe the differences in the usage factor shown on line GG of Exhibit DMW-3.

18 A. The usage factor is based upon the ratio of the amount of space a cable attachment occupies to the total usable space per
19 pole. The presumption that a cable attachment occupies one foot of space per pole has been accepted by both parties. Mass.
20 Electric's calculation reflects a usage factor of 11.00% percent per pole, while the Complainants calculation implies the usage
21 factor should be 7.41%. The difference is the result of the parties' view of the amount of usable space per pole. Mass.
22 Electric's calculation to develop usable space per pole, as stated above, starts with the development of the actual pole height of
23 the wood distribution poles recorded in Mass. Electric's pole inventory database. Certain unusable amounts of the pole such as
24 burial, minimum attachment height, safety space and pole tops deemed unusable by Mass. Electric construction standards are
25 removed from the actual average pole height. The remaining amount of space is considered to be the average usable space per
26 pole and is the basis for determining the usage factor.

27
28 I defer to the direct testimony of Messrs. Anundson and Clapp to provide the rationale for developing and supporting the usable
29 portion of Mass. Electric's poles.

1 The Complainants have used the rebuttable presumption of 13.5 feet of usable space per pole to develop their usage factor
2 calculation, which Mass. Electric rebuts in the testimony of Messrs. Anundson and Clapp.

3

4 **SUMMARY**

5 Q. Would you please summarize the calculation of the pole attachment rate?

6 A. As described above, in accordance with the formula approved by the Department in Docket 97-82, the pole attachment rate is
7 calculated by multiplying the net investment per bare pole by an annual carrying charge percentage and by the attachment use
8 ratio, based upon actual average pole heights. The Mass. Electric calculation, which is provided on page 1 of Exhibit DMW-1,
9 results in a pole attachment rate of \$15.84 per solely owned pole. This is calculated by multiplying the net investment per bare
10 pole of \$382 by an annual carrying charge of 37.70% and a use ratio of 11.00% based upon actual pole data.

11

12 **CONCLUSION**

13 Q. Does this conclude your testimony?

14 A. Yes it does.

Table of Contents

I. Introduction1

II. Purpose of Testimony1

III. Pole Attachment Rate Calculation2

IV. Net Investment per Bare Pole4

V. Carrying Charge Calculation12

VI. Usable Space Calculation16

VII. Comparison of Calculations20

VIII. Summary24

IX. Conclusion25

TABLE OF CONTENTS

| | | |
|-------|------------------------------------|----|
| I. | BACKGROUND | 1 |
| II. | PURPOSE OF TESTIMONY | 1 |
| III. | USABLE SPACE | 1 |
| IV. | AVERAGE HEIGHT ABOVE GROUND..... | 2 |
| V. | LOWEST USABLE POLE ATTACHMENT..... | 3 |
| VI. | WORKER SAFETY SPACE..... | 4 |
| VII. | POLE TOP | 11 |
| VIII. | USE RATIO | 12 |

I. BACKGROUND

Q. Please state your name and business address.

A. My name is G. Paul Anundson. My business address is 55 Bearfoot Road, Northborough, Massachusetts, 01532.

Q. Have you submitted earlier testimony in this proceeding?

A. Yes. I submitted an earlier affidavit for Massachusetts Electric's response and request for hearing.

II. PURPOSE OF TESTIMONY

Q. What is the purpose of your testimony?

A. I have been asked to discuss a number of issues dealing with usable space and the use ratio. The use ratio is one of the three basic factors in the calculation of pole attachment rates. Costs associated with the pole are allocated on the basis of space on the pole through the use ratio. The use ratio is the space used by an attachment divided by the usable space on the pole. The issue of what space on a pole is "usable" and the use ratio are closely linked.

III. USABLE SPACE

Q. What is "usable space?"

A. Usable space is the total space on a pole that is available for attachments "above the lowest permissible point of attachment of a wire or cable upon such pole which will result in compliance with any applicable law, regulation, or electrical safety code . . ." *G.L. c. 166, § 25A.*

Q. What are pole attachments?

A. Cable operators, telephone service providers and electric utilities use wires to provide services to their customers. Whether we are talking about cable, telephone or electric service, each customer must be connected by wire to the service provider. Poles carry those wires, and related equipment, to deliver services to customers. Poles are useful because they allow wire-based services to connect to their customers. While we frequently talk about "pole attachments," we are really talking about wires.

IV. AVERAGE HEIGHT ABOVE GROUND

1 Q. How is the average pole height derived?

2 A. Mr. Webster has calculated the average pole height above ground in Massachusetts Electric's system. This has been done using
3 only poles with cable attachments to them. Massachusetts Electric maintains computerized records on individual poles. Data
4 from these individual pole records was compiled to produce the statistical information used by Mr. Webster.

5

6 Q. How is the average pole embedment derived?

7 A. The average pole embedment was calculated by using 10% of the pole length plus 2 feet.

8

9 **V. LOWEST USABLE POLE ATTACHMENT**

10 Q. What is the lowest usable attachment height?

11 A. This is the lowest point on a pole that can be used to attach a wire. The location of this lowest attachment point is governed by
12 the requirements of the National Electrical Safety Code (NESC) and the sag of the wire. Mr. Clapp's testimony on behalf of
13 Massachusetts Electric explains these requirements in detail. All sections of the NESC referred to in my testimony, may be
14 found in Exhibit GPA-1.

15

16 Q. What is the effect of the NESC on the lowest usable pole attachment?

17 A. The NESC does not specify minimum attachment heights at the pole, but rather specifies clearances wires must maintain at any
18 point in the span of wire between poles. Joint use poles (poles used for both communications and electric wires) are typically
19 local service lines, built along roads, where a communications wire is the lowest wire. For communications wires, the NESC
20 requires 15.5 feet of ground clearance at any point in the span, under the worst case of the wire at: (1) 120°F, (2) its maximum
21 operating temperature or (3) 32°F with ice. *NESC Rule 232A, Rule 232B, Table 232-1*. This group of conditions accounts for
22 the normally expected vertical movement of wires as the weather and their use varies.

23

24 Q. What is the effect of the sag of the wire on the lowest usable pole attachment?

25 A. The sag of the wire must also be accounted for. Sag and tension installation information for Complainants' wire installations
26 has been requested but not yet received.

27

28 Q. What is the lowest usable pole attachment height?

1 A. Typically, these requirements combine to require that the lowest communications wire must be attached to a pole at least 18.5
2 feet above ground. I may make additional comments on this subject after we have received the sag and tension data we have
3 requested from the Complainants.

4
5 Q. Do minimum ground clearances for the electric wires play a part in determining the lowest usable attachment height?

6 A. Not on joint use poles. For joint use poles, the lowest wire is typically a communications wire. Or to put it another way, if the
7 lowest wire is an electric wire, that would be because the pole is not a joint use pole. These poles are not part of this discussion,
8 because, by definition, they do not have cable attachments.

9
10 The lowest electric wire on a pole is typically a secondary wire. The ground clearance required for these wires is 6 inches more
11 than that required for a communications wire. Clearances required between a secondary wire and the communications are
12 greater than the additional 6 inches of clearance required for the secondary wire. Therefore, the ground clearance required for
13 electric wires do not control the lowest usable attachment point on joint use poles. I will cover this in more detail as I discuss
14 the worker safety space below.

15
16 **VI. WORKER SAFETY SPACE**

17 Q. What is the "worker safety space" and when is it required?

18 A. The worker safety space creates a discrete area for communications wires and communications workers on the pole by
19 physically separating electric and communications wires. The NESC allows the creation of this discrete communications space
20 on poles when communications companies do not want to invest in the worker and equipment requirements to use the electric
21 supply space on the pole. The worker safety space would not be required but for the presence of communications wires on the
22 poles, wires like those of the cable television operators.

23
24 Q. Why is the worker safety space unusable space?

25 A. According to the NESC, the worker safety space between the supply and communications space cannot be used for the
26 attachment of wires or cables. As with the space below the lowest usable attachment, because this space cannot be used for
27 attaching wires, it is not usable for getting wires to customers.

28
29 Q. What are the requirements for the worker safety space?

1 A. To create a separate communications space, the NESC has two distinct separate requirements for the worker safety space that
2 separates the electric and communications spaces. For the typical case where the lowest electric wire, closest to the
3 communications wires, is a secondary wire, the required clearances are: (1) 40" minimum separation at the pole and (2) 30"
4 minimum separation at any point in the span between poles. *NESC Rule 235C, Table 235-5*. These requirements are not
5 alternatives, but rather separate requirements, each of which must be met. These clearances are surface to surface, not center to
6 center separations. The clearances in the span must be maintained when the secondary is at maximum sag caused by (1) its
7 maximum design operating temperature or (2) ice loading.

8
9 Q. So how big is the worker safety space?

10 A. Under the conditions described above, the worker safety space is at least 40 inches, but may need to be larger.
11

12 Q. You said earlier that the NESC allows the creation of a distinct communications space on joint use poles if a separate safety
13 space is not created. What happens if a separate communications space is not created?

14 A. Two developments occur. First, the clearance required between the electric secondary and the communications wire changes.
15 Second, the NESC requires qualified electrical workers to maintain the communications facilities on a pole without the separate
16 communications space. Qualifying communications workers to work in a supply space would require additional training and
17 equipment and generally add to the communications company's costs. Thus, the cable operators gain an economic advantage
18 with the creation of the safety space. By paying the costs of providing the worker safety space, an electric utility is subsidizing
19 the cable operator's operations. All of the Complainants in this proceeding attach in the communications space and thus benefit
20 from the worker safety space.

21
22 Q. So what would the clearance requirements be if no distinct communications space were created?

23 A. There are again two distinct requirements. In this case the communications would be considered to be in the electric supply
24 space on the pole. The required separations would be 16" at the pole and 12" at any point in the span, with conditions as
25 described above.

26
27 Q. What about the less stringent worker requirements for communications wires installed in a communications?

28 A. A communications space is created by providing the worker safety space between the electric supply and communications
29 spaces on the pole. The NESC permits workers with lesser qualifications than those of qualified electrical workers to work in
30 this communications space. Without the worker safety space, between the electric supply and communications wires, the

NESC would require the use of highly trained electrical workers and insulated bucket trucks for cable television installation and repairs. This means that cable operators can use less expensive equipment for pole work than can electric distribution companies. The worker safety space benefits communications companies, such as the cable television operators, not electric distribution companies and their customers.

Q. And how do the electric companies benefit from the worker safety space?

A. They don't. In fact, creating the worker safety space adds to the costs of the electric utilities. The poles are taller than they would otherwise have to be, forcing electric utilities to purchase taller bucket trucks and spend more getting personnel, equipment and materials to the top of the pole.

Q. In his prepared testimony, Mr. Glist (p. 24) says that the worker safety space "does not exist on poles used solely for cable or for cable and telephone" and therefore the worker safety space should be allocated to the electric utility. Do you have any response to this?

A. Yes. The worker safety space does not exist on a pole used only for electric supply and therefore the worker safety space should be allocated to the communications companies. In fact, the worker safety space exists only on poles used for both communications and electric and only when a separate communications space is created. Since the worker safety space is needed only because both communications and electric wires are on the pole and neither communications or electric wires can be placed in the space, it is much more reasonable to call the space unusable than to try to allocate it just one of the parties.

Q. Mr. Glist also says that the worker safety space "exists only for electrical attachments which must maintain a prescribed distance from all conductors of differing voltages and applications." Any comment?

A. Mr. Glist's statement is based on a misunderstanding of the NESC. The NESC imposes separation requirements, but does not assign the responsibility for meeting them to any one party on the pole. Rather, the NESC assigns responsibility for meeting the requirements to all parties. *NESC Rule 012*. Meeting the clearance requirements of the NESC is the responsibility of all parties on the pole, including the cable operators. As explained above, the clearance requirements are designed to create a communications space that allows communications workers to work on the pole, without having to be qualified to work in an electric supply space on the pole.

Q. In his testimony, Mr. Glist (p. 24-5) says that the worker safety space is required "by electric companies to maintain their own minimum clearances above grade." Do you have any response to this?

1 A. The lowest electric wire on a pole is typically a secondary wire. The ground clearance required for these wires is 6 inches more
2 than that required for a communications wire. Clearances required between a secondary wire and the communications are at
3 least 40 inches. This is much larger than the additional 6 inches of clearance required for the secondary wire. The worker
4 safety space is not required for an electric utility to meet ground clearance requirements.

5
6 Q. Mr. Glist (p. 25) argues that the worker safety space is usable because street lights may be placed in this space. Do you have
7 any comment on this?

8 A. The value of poles is in delivering wires-based services to customers. The few things that may be placed on parts of a pole that
9 are unusable for wires do not affect, either way, the ability of a pole to carry wires. Because of the importance of street lights in
10 promoting public safety and the importance of proper height above ground in their effectiveness, the NESC give considerable
11 flexibility to the placement of street lights on poles.

12
13 Other pieces of equipment may be attached to parts of a pole that are unusable for wire attachments. For example, cable
14 operators frequently place power supplies and equipment cabinets on poles below the lowest possible wire attachment height.
15 Massachusetts Electric does not include these uses of the poles by the cable operators in pole attachment rates. The
16 department's formula does not provide for this allocation. However, it is as reasonable to argue that this makes the lower part
17 of the pole usable and that it should be allocated to the cable operator as it is to argue that placement of street lights in the
18 worker safety space makes that space usable. In each case, the space still is not usable for wire attachments.

19
20 Q. In his testimony, Mr. Glist states that another reason the worker safety space is usable is that "cable operators have paid
21 through makeready (sic) to create the neutral space when it is not already in place on joint use poles." (P. 25) Any response?

22 A. This is not correct. Cable operators do pay the costs to make some poles ready for their attachments. The make ready work
23 generally does not create the worker safety space as Mr. Glist suggests, but rather relocates it. Massachusetts Electric has
24 generally designed its poles to accommodate joint use by electric and communications wires. Approximately 497,000 or 86%
25 of our poles are jointly owned and used with a telephone company. Approximately 94% of attachments by cable operators are
26 made to these poles that were already joint use poles. These jointly owned poles already had a separate communications space.
27 To further this accommodation, Massachusetts Electric has recently increased its standard pole height from 35 feet to 40 feet.
28 This design allows efficient use of pole plant and has been used to accommodate cable attachments, usually without pole
29 replacements. Typically, when make ready work is required to accommodate a cable attachment, the work rearranges wires on
30 a pole to relocate, not create, the worker safety space. By moving the worker safety space on a pole, the communications space
31 is enlarged to accommodate the cable attachment. Occasionally, when there is not sufficient space on a pole to accommodate

1 the additional attachment, the pole must be replaced. The only time make ready work would be required to create the worker
2 safety space would be to accommodate cable attachments to solely owned and used electric poles where the worker safety space
3 did not already exist. The cost of poles are supported through the general pole attachment rates, not through make ready
4 charges.

5
6 Q. What does all of this tell us about the worker safety space?

7 A. What this all means is that the worker safety space is unusable space. The reason for putting up a pole is to carry wires to reach
8 customers. Poles don't serve customers, wires do. No one can put a wire in the worker safety space and this space is unusable.
9

10
11 **VII. POLE TOP**

12 Q. What is the "pole top" and why is it unusable?

13 A. For simple physical reasons, attachments cannot be made to the top of a wood pole. Attachments to a pole are made by bolts
14 through the pole. For a bolt to hold and not split the pole apart, the bolt must be attached a few inches below the top of the pole.
15 Massachusetts Electric standards require that the center of the top bolt hole be 5 inches down from the top of the pole. A
16 photograph of a pole with a pole top pin may be seen in Exhibit GPA-2.

17
18 Q. In his testimony, Mr. Glist (p. 22) argues that the use of pole top pins and pole top extensions extend the usable space on the
19 pole. Do you agree?

20 A. No. Pole top pins and pole top extensions are attached to the pole. As with any other attachment to the pole, the physical
21 attachment is made by means of bolts through the pole. These bolts are the attachment point and they are at least 5 inches
22 below the top of the pole. The highest usable attachment point to the pole is still 5 inches below the top of the pole.

23
24 Mr. Glist also argues that the cost of pole top pins and pole top extensions should be excluded from the cost a bare pole.

25 *Testimony at p. 13 and Exhibit PG-4, Breakdown of 364 at p. 2.* This seems logically inconsistent. However, if the

26 Department determines that the 5 inches at the top of the pole is usable space, then the pole top pins and extensions attached to
27 that space should be included in the cost of a bare pole. If these create more usable space, they should be included in the cost of
28 a bare pole because they help create the usable space that the cable operators are using.

VIII. USE RATIO

Q. In his testimony, Mr. Glist (p. 27) argues that the space used by cable operators is “pure surplus” or that the cable operators have paid make ready costs to create “surplus space” on the poles and that this justifies a lower use ratio for pole attachment fees. Do you agree with his statements?

A. No. First, the pole attachment fee is calculated on a fully allocated cost basis, not an incremental cost basis. On a fully allocated cost basis, as adopted by the Department, this discussion is wholly irrelevant.

Second, on many poles, the cable operators do use existing space. To say that this space is “surplus” is inaccurate. While the space may not have been in use the day the cable operator came up to attach, this space is now unavailable to the electric customers that paid to create it. To argue that this justifies taking it away any future use to benefit those customers without compensating them is unreasonable. The effect would be the cross-subsidization of cable companies by electric utility customers.

Third, in those instances in which cable companies do pay to enlarge poles for their own use, their payment of “make ready costs” does not support a lower use ratio. Cable operators pay “make ready costs” to accommodate them so that electric utility customers do not have to pay the immediate costs of accommodating the expansion of a cable operator’s system.

Q. In his testimony, Mr. Glist (p. 28) argues that the use ratio should be reduced because cable facilities “occupy the least amount of pole space, are . . . the lightest conductors on the pole . . . Moreover, cable operators also attach the fewest facilities to the pole.” Do you agree?

A. I agree that cable attachments use about one foot of space on a pole. This one foot of space used by cable attachments has already been accounted for in the use ratio and forms the basis for the allocation of costs in Massachusetts Electric’s filing. Since this has already been accounted for in the use ratio, it cannot justify a further reduction of the use ratio.

Moreover, cable operators pay only for the attachments they do make on the pole. The other utilities support the parts of the pole they use for electric or telephone services. Again, this is cost allocation based on use. It does not justify a further reduction of the use ratio for cable operators.

1 Third, the weight of the cable attachments is irrelevant. The cost allocation is based on space, not pole loading. The
2 Complainants have not proposed an alternative cost allocation based on pole loading. If pole loading were the basis for cost
3 allocation, weight is not the appropriate element of pole loading. Horizontal loading of the pole, from wind, generally limits
4 what may be placed on a pole. The outside diameter of a cable wire is generally in the same range, about 5/8 inch to 1 inch, as
5 other wires attached to poles. Multiple cables are commonly supported on a single messenger wires of 1/4 inch to 3/8 inch
6 diameter. The resulting wind load that must be supported by the pole is about the same as for other wires on the pole. Mr.
7 Clapp covers this subject thoroughly in his testimony.

8
9 Q. Can you compare the rights of the Complainants and of Massachusetts Electric as the pole owner with regard to use of any
10 space on a pole?

11 A. Under the Telecommunications Act of 1996 (TCA), utilities like Massachusetts Electric must provide cable operators with
12 access to poles. This mandatory access requirement does not define specific locations on a pole. Nor do the aerial license
13 agreements between cable operators and Massachusetts Electric define a specific location on a pole for any particular party on
14 the pole. The NESC defines communications and electric space only by the required separation, the worker safety space, not by
15 allocating a specific location on the pole.

16
17 There is no mandatory access provision in the TCA that requires any party to give Massachusetts Electric access to poles. The
18 only rights Massachusetts Electric has to use any pole come from ownership or negotiated contract. For example,
19 Massachusetts Electric has a longstanding negotiated contract with Bell Atlantic to share ownership of poles. Under this
20 contract the joint owners have allocated particular portions of poles for use by each of the joint owners. This puts the electric
21 wires at the top of the pole and the telephone wires below. The TCA requires that a cable operator be given access regardless of
22 these preexisting contract rights of the owners. The owners are required to rearrange or relocate wires on a pole or replace the
23 pole, if necessary, to accommodate cable operators.

24
25 In practice, this means that each of the parties on the pole has similar obligation to rearrange or relocate wires on the pole or
26 transfer them to a new pole to accommodate others on the pole.

27
28 Q. In his testimony, Mr. Glist claims that the rights of cable operators to use a pole are inferior to those of Massachusetts Electric
29 because the cable operators must "be licensed pole by pole" (p. 28) while the under the joint ownership arrangement for
30 Massachusetts Electric "poles are made available for use in broad regions." Do you agree?

1 A. No. Poles must always be considered on a pole by pole basis, no matter who is attaching. Cable operators are licensed on a
2 pole by pole basis for two reasons. First, the pole owners must know what and who is attached to the pole. Second, the pole
3 must be analyzed to determine whether there is adequate space and strength for the attachment and what, if any, work is
4 required to accommodate the attachment.

5
6 These and similar requirements also apply to joint owners of poles. Attachments must always be considered on a pole by pole
7 basis. When one of the parties to the joint ownership agreement wants to attach to a pole owned solely by the other, the
8 attaching party must get approval and purchase an ownership interest in that pole. Even new poles must be handled on a pole
9 by pole basis with each of the parties deciding whether it wants to purchase an ownership interest in each individual pole. In
10 general, pole size and strength are determined by the anticipated needs for that particular pole, with appropriate consideration
11 given to surrounding terrain. For most poles, joint use is expected and allowed for in the initial design. Occasionally, where
12 one party has indicated that it does not anticipate a need to use a particular pole and no other users are anticipated, the size and
13 strength of that pole may be selected for use by only one party.

14
15 Q. In his testimony, Mr. Glist argues that the use ratio should be reduced because cable operators have inferior rights to use the
16 pole since they sometimes pay "make ready costs" to accommodate their attachments (p. 28). Do you agree?

17 A. No. It is true that when a pole must be replaced to allow a cable attachment, the cable operator must pay the costs of replacing
18 the pole. It would be unreasonable to require electric utility customers to pay this cost. The electric paid for the pole that was
19 there, had no need to replace the pole and should not be expected to provide the capital for the development of the cable
20 operator's system. When the pole owners need to replace poles to accommodate expansion of their own systems, they pay the
21 pole replacement cost. Basically, the party that drives the need, pays the costs. This, again, does not affect the use ratio.

22
23 Q. On page 23 of his testimony, lines 18-19, Mr. Glist alleges that the FCC has recently reaffirmed its treatment of the worker safety
24 space as usable. Do you concur with his statement?

25
26 A. No, Mr. Glist has not fairly depicted the FCC's order. Since the passage of the Telecommunications Act of 1996, the FCC has
27 engaged in numerous implementing rulemakings. During the course of its deliberations over pole attachments, the FCC has
28 repeatedly been asked to address the allocation of costs associated with the 40-inch safety space required to permit communications
29 workers on poles used to carry electricity. Although the FCC, in CS Docket No. 97-151, Report and Order, February 6, 1998,
30 made many determinations regarding pole attachment charges for communications companies, it reserved its decision on the total
31 amount of usable space issue until the resolution of another open proceeding on attachment charges. "For the present time", the

1 FCC stated at ¶83, “the presumption that a pole contains 13.5 feet of usable space will remain applicable.” (emphasis added) This
2 issue is under active reconsideration by the FCC and has not been reaffirmed *ad infinitum* as Mr. Glist would have the Department
3 believe.

4

5 Q. Does this conclude your testimony?

6 A. Yes, it does.